

memorandum



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To INCITS T10 Committee
From Curtis Ballard, HP
Subject Cleaning error codes usage

Date
09 July, 2008

Revision History

Revision 0 – Initial document
Revision 1 – Added model clause describing cleaning and auto-clean
Revised usage of suggested exception codes table (table y)

Related Documents

smc3r11 – SCSI Media Changer Commands - 3 revision 04
spc3r23 – SCSI Primary Commands -3 revision 23

Background

The working group has requested that I prepare a proposal for a standardized usage of the CLEANING REQUESTED and CLEANING FAILURE error codes in action item 07-003. This proposal fulfills that action item.

In the proposed changes that follow, new text appears in **blue** or **purple**, deleted text appears in **red-strikeout**, and editorial comments appear in **green**.

Proposed Changes to SMC-3

New Model Clause section 5.6

5.6 Data Transfer Device Cleaning

5.6.1 Data Transfer Device Cleaning Introduction

A data transfer device may support being cleaned by loading a volume containing cleaning medium (see table 26). When a data transfer device that supports cleaning detects that a volume containing cleaning medium has been loaded it may automatically start the cleaning process and execute the cleaning process then unthread the volume. While a data transfer device is executing a cleaning process, access by the medium transport element may be prohibited.

5.6.2 Reporting Data Transfer Device Cleaning Requests

A medium changer may report a data transfer device cleaning request by setting the exception (EXCEPT) bit in a data transfer element descriptor (see 6.11.7) to one and setting the additional sense code to CLEANING REQUESTED.

5.6.3 Cleaning Data Transfer Devices

An application client may clean a data transfer device by moving a volume containing a cleaning medium (see table 26) to the element containing the data transfer device. When a volume containing a cleaning medium is moved to an element containing a data transfer device, then the device server shall report status upon detection of a successful load operation. The method for detecting a successful load operation is not specified by this standard.

While a data transfer device is executing a cleaning process, a command that requires access to the volume in the data transfer device shall be rejected with CHECK CONDITION status. The sense key shall be set to NOT READY and the additional sense code shall be set to CLEANING CARTRIDGE INSTALLED.

Comment: CLEANING CARTRIDGE INSTALLED is an existing additional sense code but does not have the 'M' bit set

Note: After moving a volume containing a cleaning medium to a data transfer device an application client may use the CLEANING CARTRIDGE INSTALLED additional sense data returned in response to a command that requires access to the volume in the data transfer device to monitor for cleaning completion.

Comment: This behavior is probably different from any behavior currently in use and may require specific support from ISV's since a MOVE MEDIUM command will be rejected when cleaning is in progress where many libraries today will hold the command until the cleaning process is complete. Using this method however doesn't require device specific timeouts for cleaning and doesn't tie up the medium changer while the clean operation is in progress. The application client can poll using the MOVE MEDIUM command until the clean is done or some really long timeout expires and other operations can complete in between queries.

Comment 2: We could choose to define a status indication method for use with REQUEST SENSE similar to that used in other areas of the SCSI standards but since the application client will already be using MOVE MEDIUM commands and rejecting a MOVE MEDIUM while a clean is in progress resolves some issues we have today just using that to track status was preferred.

When a cleaning operation is complete the medium changer should issue commands required to prepare a data transfer device for unload to the data transfer device. The method by which a data transfer device is prepared for unload is not specified by this standard.

When a command is successfully processed that moves a volume containing a cleaning medium from a data transfer device and the data transfer device reports a cleaning error, then the command shall return CHECK CONDITION status with the sense key set to RECOVERED ERROR, and the additional sense code set to

- 1) CLEANING FAILURE if the data transfer device reports a cleaning failure; or
- 2) CLEANING VOLUME EXPIRED if the data transfer device reports an expired cleaning volume.

NOTE: A CLEANING VOLUME EXPIRED additional sense code indicates that the cleaning completed successfully but the cleaning volume was expired at the completion of the cleaning operation. A CLEANING FAILURE additional sense code may have been caused by an expired cleaning volume or another error.

Comment: CLEANING VOLUME EXPIRED is a new additional sense code

5.6.4 Auto-Cleaning

A media changer that reports an auto clean enabled (ACE) bit set to one in the device capabilities mode page (see 7.3.2) shall detect when a data transfer device requires cleaning and perform an auto-clean operation by automatically moving a cleaning volume to the data transfer device and back to the source storage element when the data transfer device has completed the cleaning process. A medium changer that supports auto-cleaning shall not report cleaning requests (see 5.6.2).

When processing a command that requires access to data transfer device while a device server is executing an auto-clean operation, the device server shall

- a) complete the auto-clean operation before processing the command; or
- b) terminate the command with CHECK CONDITION status with the sense key set to NOT READY, and the additional sense code shall be set to CLEANING CARTRIDGE INSTALLED.

Changes to 6.11 READ ELEMENT STATUS command:

6.11 READ ELEMENT STATUS command

No changes to this section or sections 6.11.1 through 6.11.6 are proposed so they are not repeated here

6.11.7 Data transfer element descriptor

Table 29 defines the data transfer element descriptor

Table 29 – Data transfer element descriptor

Bit	7	6	5	4	3	2	1	0	
Byte									
0	(MSB)	ELEMENT ADDRESS							
1								(LSB)	
2	Reserved			ACCESS	EXCEPT	Reserved	FULL		
3	Reserved								
4	ADDITIONAL SENSE CODE								
5	ADDITIONAL SENSE CODE QUALIFIER								
6	Obsolete	Reserved	Obsolete	Obsolete	Reserved	Obsolete			
7	Obsolete								
8	Reserved								
9	SVALID	INVERT	Reserved		ED	MEDIUM TYPE			
10	(MSB)	SOURCE STORAGE ELEMENT ADDRESS							
11								(LSB)	
...									
(36 bytes)	(MSB)	PRIMARY VOLUME TAG INFORMATION (field omitted if PVOLTAG = 0)						(LSB)	
(36 bytes)	(MSB)	ALTERNATE VOLUME TAG INFORMATION (field omitted if AVOLTAG = 0)						(LSB)	
...									
(1 byte)	Reserved				CODE SET				
(1 byte)	Reserved				IDENTIFIER TYPE				
(1 byte)	Reserved								
(1 byte)	IDENTIFIER LENGTH (x)								
(x bytes)	IDENTIFIER								
...									
to z-1	Vendor-specific								

An ACCESS bit set to one indicates access to the data transfer element by the medium transport element is allowed. An ACCESS bit set to zero indicates that access to the data transfer element by a medium transport element is denied.

An exception (EXCEPT) bit set to one indicates that the element is in an abnormal state. An EXCEPT bit set to zero indicates that the element is in a normal state. If the device server detects that the data transfer device is in an abnormal state, then the device server should set the EXCEPT bit to one and information on the abnormal state may be available in the ADDITIONAL SENSE CODE field and ADDITIONAL SENSE CODE QUALIFIER field. See table y for abnormal states that should be reported.

Table y: Data Transfer Device abnormal states

Abnormal State	Additional Sense Code
Data transfer device has set a cleaning requested indicator	CLEANING REQUESTED
Data transfer device has set a cleaning failure indicator	CLEANING FAILURE
Data transfer device is being cleaned	CLEANING CARTRIDGE INSTALLED

NOTE 9 — Access to the data transfer element by medium transport elements might be denied if a data transfer operation was under way. Note that a one value in this bit may not be sufficient to ensure a successful operation. This bit only reflects the best information available to the media changer device, which may not accurately reflect the state of the data transfer device.

The ADDITIONAL SENSE CODE field may provide specific information on an abnormal element state. The values in this field are as defined for the ADDITIONAL SENSE CODE field of REQUEST SENSE command response data (see SPC-3). This field is valid only if the EXCEPT bit is set to one.

The ADDITIONAL SENSE CODE QUALIFIER field may provide more detailed information on an abnormal element state. The values in this field are as defined for the ADDITIONAL SENSE CODE QUALIFIER field of REQUEST SENSE command response data (see SPC-3). This field is valid only if the EXCEPT bit is set to one.

The CODE SET field and IDENTIFIER TYPE field are defined in 6.11.8.

The IDENTIFIER LENGTH field contains the length in bytes of the IDENTIFIER field (see 6.11.8). If no device identifier is available, or the DVCID bit in the CDB is set to zero, the IDENTIFIER LENGTH field shall be zero and the CODE SET field and IDENTIFIER TYPE field shall also be zero.

The IDENTIFIER field provides a device identifier for the data transfer device associated with this data transfer element as defined in 6.11.8. If no device identifier is available for this element, or the DVCID bit in the CDB is set to zero, this field shall be omitted.

For fields not defined in this subclause, see 6.11.4.